Straight Vegetable Oil (SVO) Technology
PEAS Farm

University of Montana, Missoula

GARDEN CITY HARVEST

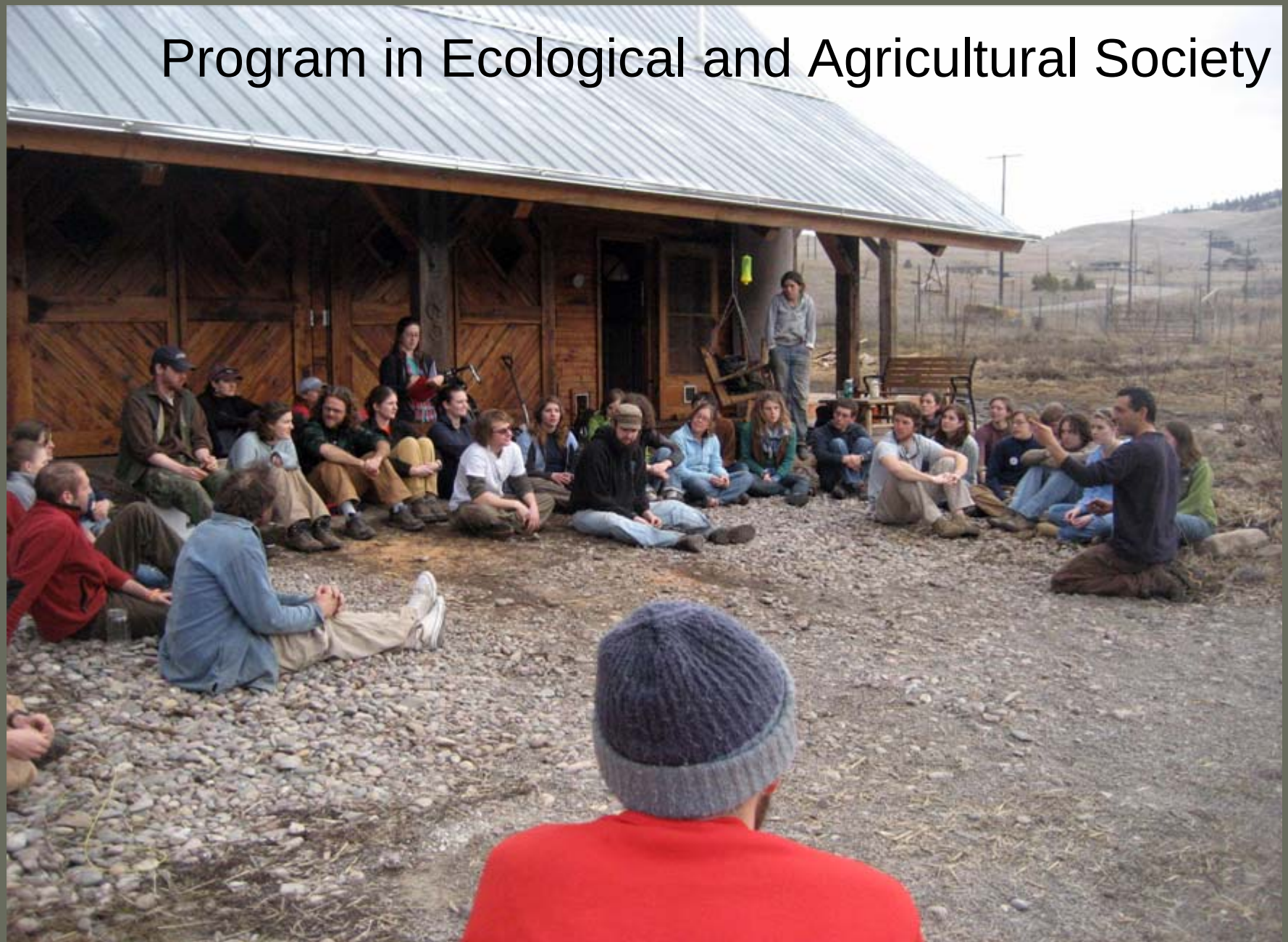
MICHAEL GALLACHER/Missoulian

In the near future, Missoula's Garden City Harvest PEAS farm intern Derek Kanwischer will be adding vegetable oil to the farm's tractor instead of diesel fuel. Thanks to a $3,000 donation from the National Center for Appropriate Technology, one of the farm's tractors will be retrofitted to burn vegetable oil.

Vegetable oil to go

PEAS farm receives grant to adapt tractor to run on alternative fuel

PEAS Farm



SVO Feasibility

- Vision
- Primary focus of study (process)

3 tractors

- Petroleum diesel: Clark Fork Organics
- B-20: River Road Garden
- SVO: Elsbett conversion system

Dynamometer (Dyno-testing)

Common Problems with SVO

- Not a lot of information available
- Engine conversion obstacles
- **Viscosity**

- Injectors: atomization
- Glazing, coking and gumming
- Engine damage

SVO Conversion

- Advantages
  - Farm self-sufficiency
  - Carbon neutral
  - No harmful chemicals
  - No wasteful byproducts

  - **Advance the potential knowledge-base of options for small-scale farmers in Montana**

Elsbett single tank conversion

- Replacement injector nozzles
- Replacement glow-plugs
- Electrical heat band
- Electrical relays designed for glow-plugs and filter heater
- Coolant-powered heat exchanger serves as secondary heat source from radiator
- Replacement hoses

Kubota Fuel Cycle

Figure 1. Stock Kubota fuel cycle

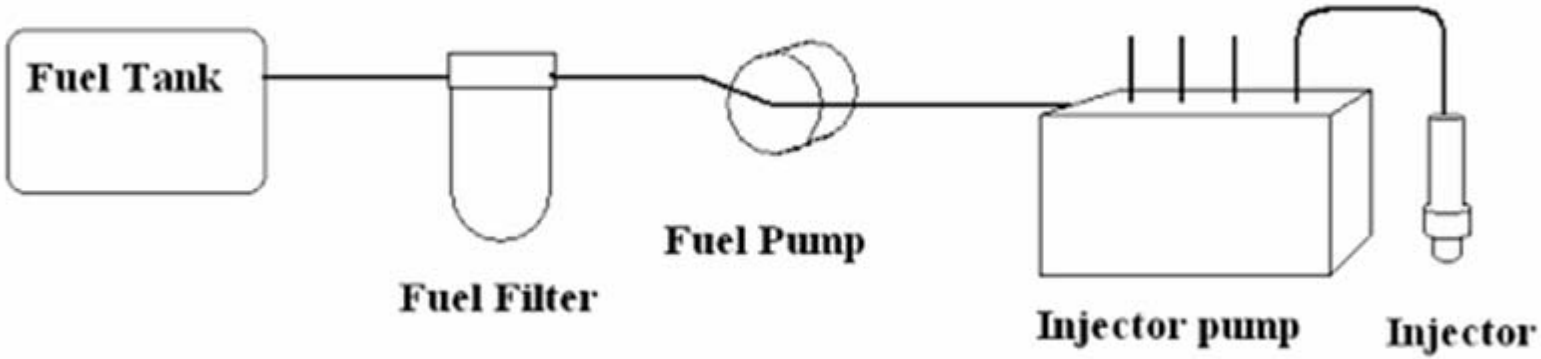


Figure 1. Stock Kubota fuel cycle

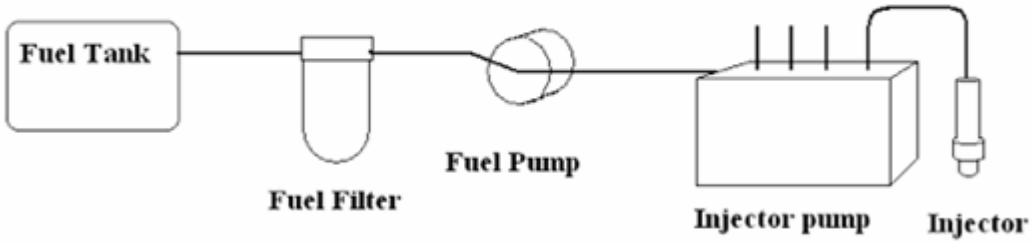
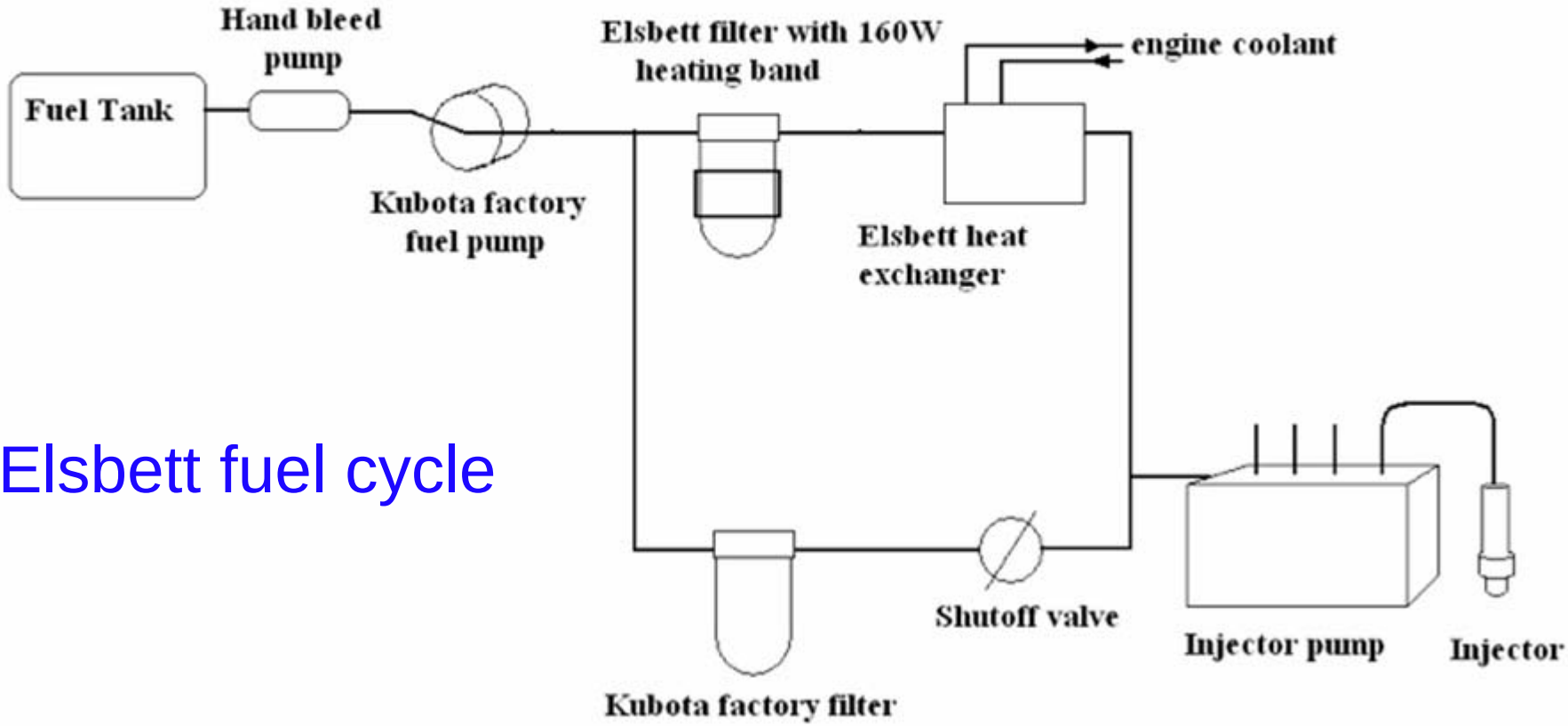


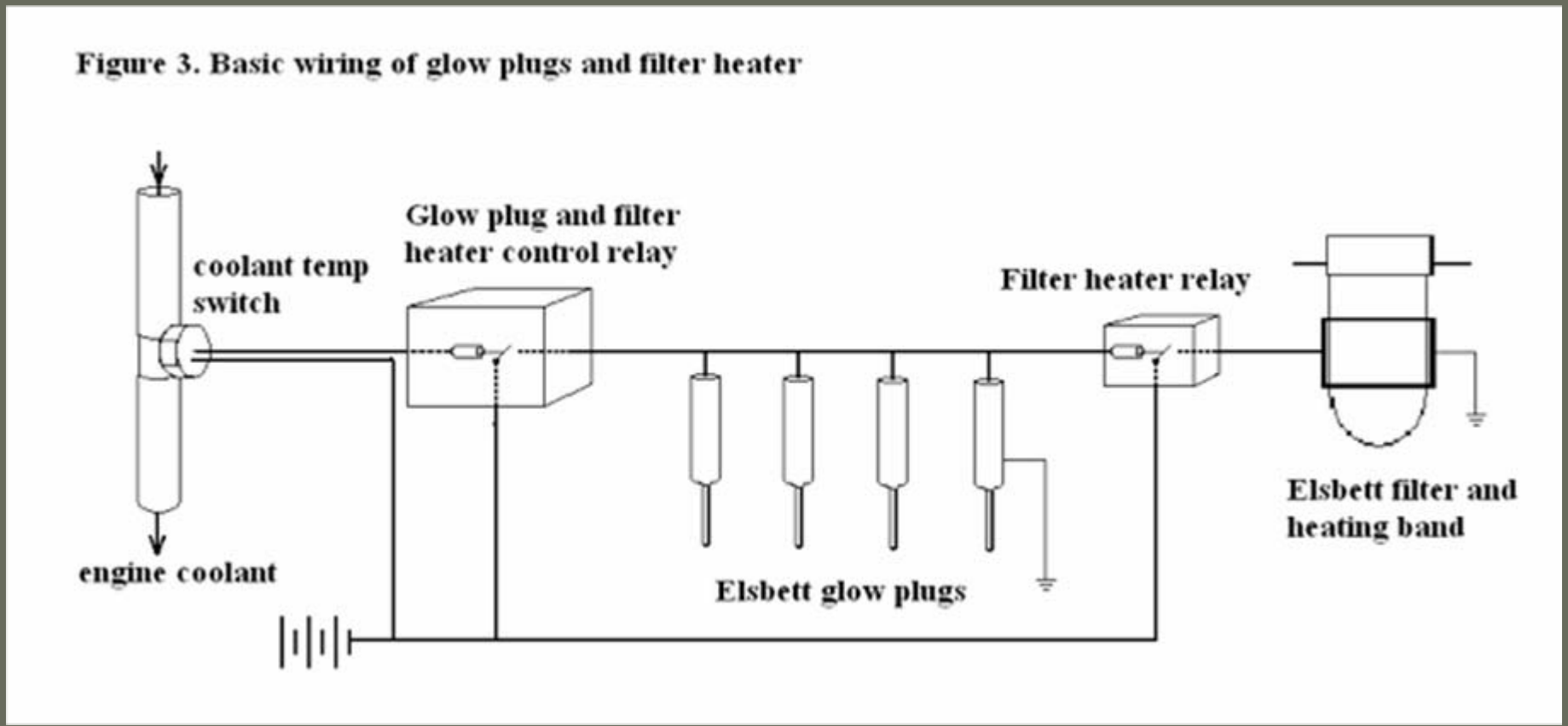
Figure 2. Elsbett SVO fuel cycle conversion



Elsbett fuel cycle


UBOTA
L4630

Basic Wiring Diagram



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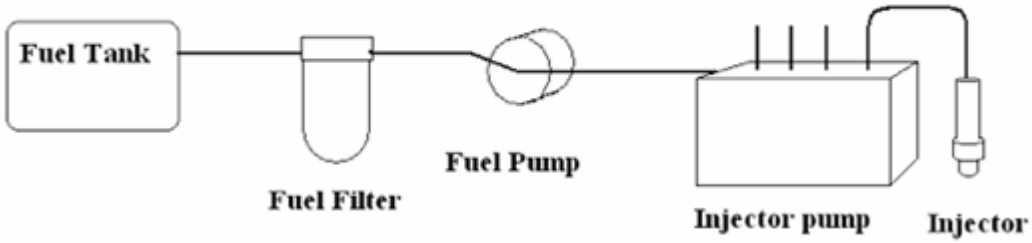

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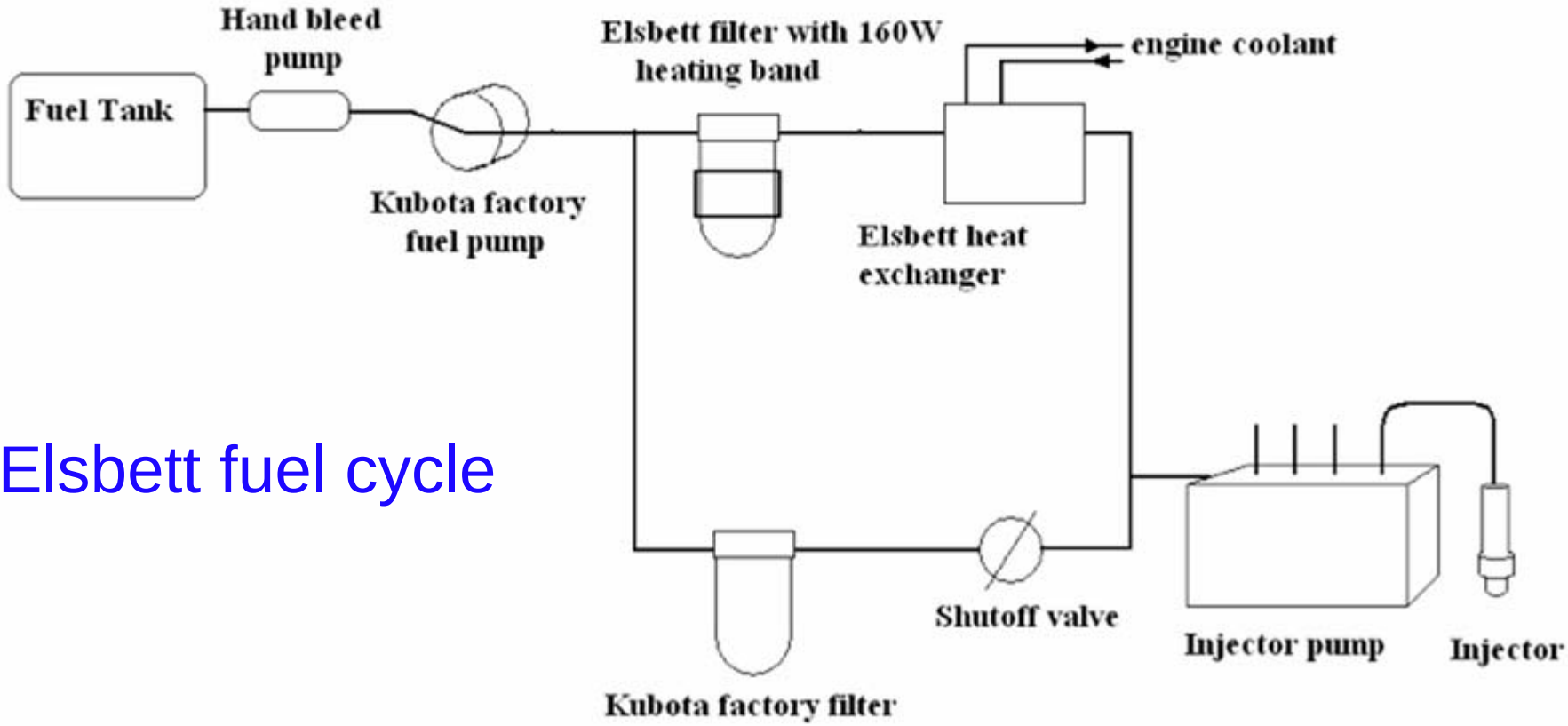


Elsbett fuel cycle


PICTURE HANGIN'


KUBOTA
LA853

Hard Starting

- Dynamometer Test (drop in horsepower)

- If any of the tractors were to experience a significant decrease in horsepower that can’t be remedied through routine maintenance, the engine will have to be broken down and examined more closely. The injectors, cylinders, and heads will have to be examined to determine what might have caused the loss in horsepower.


HST

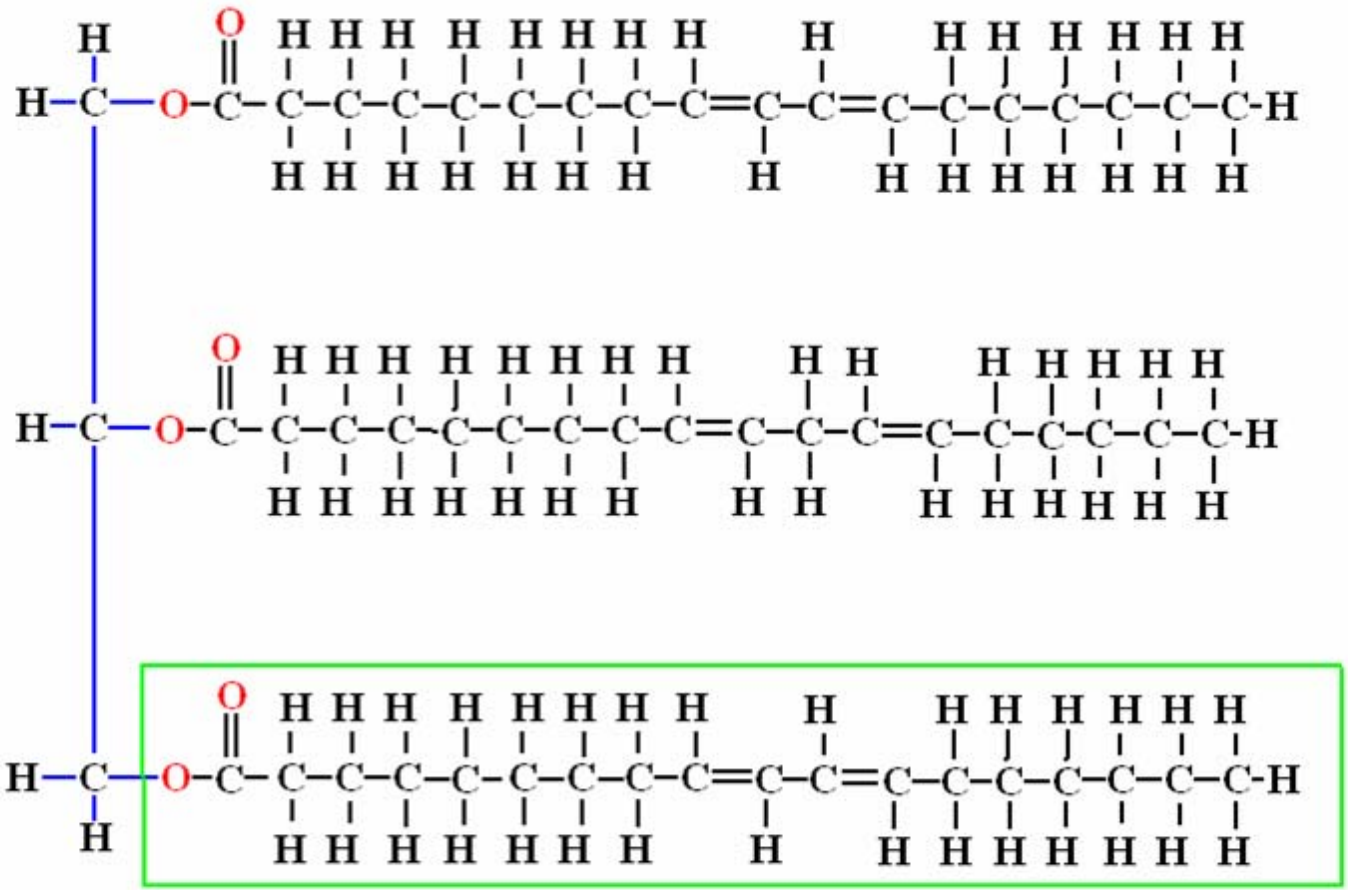
Dynamometer Testing: SVO Kubota Tractor

Figure 4. Results of dynamometer testing

Date	Engine hrs.	Fuel	Test rpm	Dyno hp	Change from diesel
3/9/07	17	diesel	2650	40	
4/27/07	52	SVO	2650	36	-10%
7/24/07	144	SVO	2650	33	-17.5%

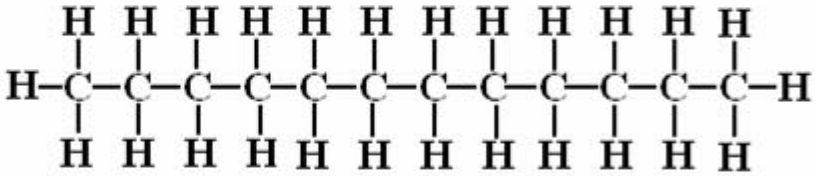
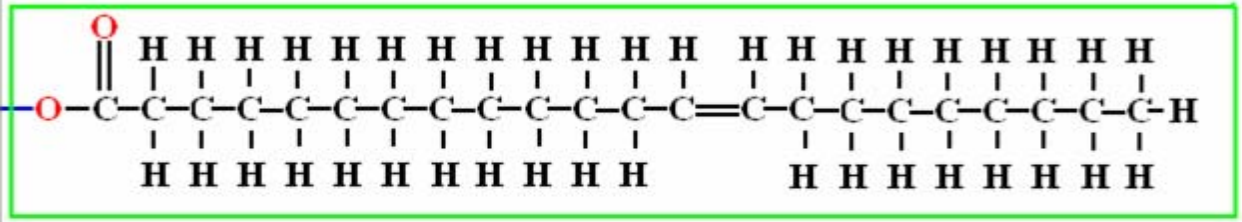
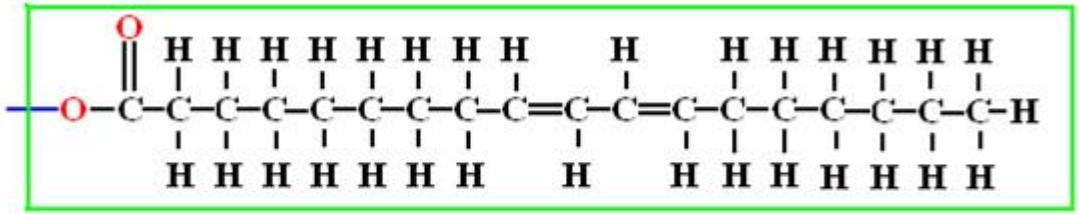
Fuel Theory

- Viscosity theory
- Glow plugs as an indicator
- Fuel chemistry



Fatty Acid Molecule : Linoleic acid (from safflower oil)

A Triglyceride: Fats and Oils

	Viscosity	Iodine Value	Reactivity (polymerization)
 Typical diesel molecule	low	low	low
 Fatty Acid Molecule: Erucic acid (from rapeseed)	moderate	moderate	moderate
 Fatty Acid Molecule: Linoleic acid (from safflower)	low	high	high

Future of SVO Project

- Finish season
- Tear down the engine if necessary
  - Oil analysis
- Analysis of engine wear
- Use a new fuel next year

Collaboration

- NCAT
- PEAS - River Road Garden - Clarkfork Organics
- EVST
- UM COT
- Kubota Tractor
- Steve Nelson
- And countless others in and beyond the Missoula community

Questions

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    - EVST/Chemistry Studies
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    - EVST Faculty/PEAS Program Director
  - Steve Nelson tritium100@hotmail.com
    - Technical/Chemistry Consultant

Problems

- Elsbett glow plugs
  - (2.5 mm longer)
- Elsbett Fuel specifications

Problems

- Elsbett Fuel specifications